

RECENT ADVANCES IN POTATO PROCESSING

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A revolution has been taking place in the potato industry in the past few years. Twenty years ago, except for chipmaking, potato processing was negligible. The frozen potato product and dehydrated potato product industries have grown to important stature only in recent years. Today about one pound out of every 3½ pounds of potatoes eaten is consumed in the form of chips, frozen products, dehydrated preparations or as a canned item. While no one knows how high processed potatoes will go in the years ahead as a fraction of total potato food use, the consensus seems to be that the plateau has not yet been reached.

Some of the largest food manufacturers and distributors in the country have been attracted to the potato processing industries. As a result of their vast resources, many millions of dollars are now expended each year in advertising potato products. This has undoubtedly been a factor in the recent increase in per capita consumption since the fresh market segment has never had extensive funds to advertise its product.

Surely the availability of the increasingly larger number of frozen and dehydrated potato products of good quality is an important element in reversing the long decline in per capita consumption. During the first fifty years of this century, per capita consumption of potatoes fell from about 200 pounds to less than 100 pounds annually. In recent years this figure has increased to about 115 pounds annually.

Slightly over 10 years ago, it was considered that about 210 million hundredweights of potatoes were required annually to provide enough for food use, seed, and allow for the inevitable culls, shrinkage and decay in storage. The national requirement has now increased to about 250 million hundredweights.

PROMOTING PRICE STABILITY

The percentage of processed potatoes, based on the total food use of potatoes, increased from 14% in 1956 to 25% in 1960. Chips and shoestring potatoes continue to require a higher tonnage of raw material than used in any other category of processing, increasing from 14½ million hundredweights in 1956 to nearly 21 million hundredweights in 1960. Frozen French fries and other frozen products have grown from the position in 1957 in which they required less than 5 million hundredweight of potatoes for their manufacture

to that of 1960 in which they required 15 million hundredweights. Dehydrated potatoes increased from a requirement of about 3 million hundredweights in 1956 to 10 million hundredweights in 1960. Use of potatoes for canned products fluctuated within the narrow limits of 2.3 and 2.9 million hundredweights during the 1956-1960 crop years.

It is generally accepted that processing a sizable fraction of a crop, such as potatoes, promotes price stability and orderly marketing. Now with processing facilities available in many areas, processors can step up operations during periods of abundance and convert a surplus into storable frozen, dehydrated and canned products.

The USDA's Economic Research Service conducted a survey about a year ago to appraise the potential market for processed potato products. Their results indicate that the retail market offers the largest potential for expanding the sales of frozen French fries and dehydrated mashed potatoes.

Processed foodstuffs do not always merely replace the use of freshly cooked food from the same commodity. It is clear that the consumption of much of the processed potatoes, for example chips, represents usage above that which would be experienced with freshly cooked potatoes.

While developments to be described here have stemmed mainly from Utilization Research, other organizations of the USDA, e.g. Farm Research and the Agricultural Marketing Service, have contributed much toward development of better potatoes for processing and in the science and technology of raw material storage and handling. This also holds for the State Agricultural Experiment Stations.

NEW USE DEVELOPMENTS

Dehydrated mashed potatoes in flake form, developed at the Eastern Utilization Research and Development Division, did not exist on the market prior to January 1958. Today there are 13 flake plants that have a capacity for processing a total of 4.8 million hundredweights of potatoes to produce 60 million pounds of flakes annually.

Dehydrated mashed potatoes in powder form (granules) were first produced in the United States about 1947, as an industrial development. Production reached the status of a heavy tonnage item beginning about 1955. Granules have been improved by laboratory and pilot plant research carried out by the Western Division

CHEMURGIC CALENDAR

- Jun 4-6 ● Technical Association of the Pulp and Paper Industry. 1st Water Conference. Netherland Hilton Hotel, Cincinnati, Ohio.
- Jun 6-8 ● Manufacturing Chemists' Association, 91st Annual Meeting, Greenbrier Hotel, White Sulphur Springs, W. Va.
- Jun 9-13 ● Air Pollution Control Assoc., Annual Meeting, Detroit, Mich. (A. Arch, 4400 Fifth Ave., Pittsburgh 13, Pa.)
- Jun 9-13 ● Institute of Paper Chemistry. 8th Industry Seminar. Appleton, Wis.
- Jun 9-12 ● National Plant Food Institute, Annual Meeting, Greenbrier Hotel, White Sulphur Springs, W. Va.
- Jun 10-28 ● Society of Women Engineers. Annual Convention. Cosmopolitan Hotel, Denver, Colo.
- Jun 13-16 ● 5th Annual National Industrial Pharmaceutical Research Conference. King's Gateway, Land O'Lakes, Wis.
- Jun 16-20 ● Association of Food and Drug Officials. 67th Annual Meeting. Jack Tar Hotel, Lansing, Mich.
- Jun 23-26 ● American Oil Chemists' Society. Short Course Program. Princeton Inn, Princeton, N.J.
- Jun 24-28 ● Gordon Research Conference on Polymers, Colby Junior College, New London, N.H.
- Jul 17-23 ● 5th International Pesticides Congress. London, England.
- Aug 9-15 ● 6th International Congress of Nutrition. International Union of Nutritional Sciences and Scottish Group of Nutrition Society of Great Britain and Ireland. Edinburgh, Scotland.
- Aug 22-24 ● American Soybean Association, 43rd Annual Convention, Deshler-Hilton Hotel, Columbus, Ohio. (Geo. M. Strayer, Exec. Vice Pres., ASA, Hudson, Iowa)
- Aug 25-28 ● Soil Conservation Society, 18th Annual Meeting. Utah State University, Logan, Utah.
- Sep 8-11 ● Canadian Agricultural Chemicals Association, Annual Meeting and Conference, Mont Tremblant Lodge, Mont Tremblant, Que.
- Sep 8-13 ● American Chemical Society, 145th National Meeting, New York, N.Y.
- Sep 29 - Oct 2 ● American Institute of Chemical Engineers, National Meeting, Hotel Americana, San Juan, Puerto Rico.
- Oct 1-2 ● National Cotton Council. 12th Annual Chemical Finishing Conference. Mayflower Hotel, Washington, D.C.
- Oct 2-4 ● Texas Nutrition Conference, Texas A. & M. College, College Station, Texas.
- Oct 6-10 ● Water Pollution Control Federation. Olympic Hotel, Seattle, Wash.
- Oct 20-23 ● Canadian Manufacturers of Chemical Specialties Association, Annual Meeting and Conference, Royal York Hotel, Toronto, Ont.
- Oct 23-25 ● The Fiber Society. National Meeting. Seaview Country Club, Absecon, N.J.

* Eastern Utilization Research and Development Division, Agricultural Research Service, United States Department of Agriculture

U.S.D.A. PATENTS OF CHEMURGIC INTEREST

Patent No. 3,084,018, April 2, 1963—To Robert E. Whitfield and Lowell A. Miller, Walnut Creek, Calif., and William L. Wasley, Berkeley, Calif., employed by the U.S. Department of Agriculture. For: A process for shrink-proofing wool with polyurethanes by treating the fibrous material with a pair of complementary direct-acting organic polyurethane-forming intermediates.

Patent No. 3,085,079—To Gus C. Mustakas, Peoria, Ill., employed by the U.S. Department of Agriculture. For: A method of preparing an air-drying conjugated soybean vinyl ether in an inactive hydrocarbon solvent in the presence of stannic chloride as a polymerization catalyst to produce a solution having a molecular weight of about 5,000 to 10,000.

Patent No. 3,087,775, April 30, 1963—To Robert M. Reinhardt and Terrence W. Fenner, New Orleans, La., employed by the U.S. Department of Agriculture. For: A process for producing alkali-soluble textile materials by nitric acid treatment of partially etherified cottons.

Patent No. 3,087,852, April 30, 1963—To Bernard T. Hofreiter, George Earle Hamerstrand, and Charles L. Mehlretter, all of Peoria, Ill., all employed by the U.S. Department of Agriculture. For: A process for substituting simple compounds in dialdehyde starch to attain a composition suitable for the manufacture of paper that has high wet strength.

Patent No. 3,087,946, April 30, 1963—To Walter A. Pons, Jr., and James C. Kuck, New Orleans, La., and Vernon L. Framp-ton, Metairie, La., all employed by the U.S. Department of Agriculture. For: A process for bleaching refined cottonseed oil and sulfurous acid saturated activated alumina.

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POTATO PROCESSING

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in the last 10 years. Dehydrated potato dice and slices have been improved in quality and storage stability as the result of research in the Western Division and the industry. Better quality dehydrated slices led to their increased popularity in home cooking and to their use in formulating prepared mixes, such as au gratin and scalloped potatoes.

Potato flakelets comprise a new product of Eastern Division engineering research awaiting commercial exploitation. Flakelets are made by mixing partially dried mashed potatoes in sheet form, taken from a drum drier, with wet mash to produce a material that can be compacted and dried. The density of this product is much higher than that of flakes and almost as high as granules. Density of the product is important where space saving is needed.

DEHYDRATION AND FREEZING

Quickly reconstitutable dehydrated potato pieces make up another new product of the Eastern Division engineering research that gives promise of eventual commercialization. The potato pieces are dehydrated to an intermediate stage, then placed in an autoclave and heated to a temperature above the boiling point of water; the pressure is suddenly released to result in pieces that have a porous structure. The puffed pieces are then quickly dried by convenient means to give a product that reconstitutes in about 5 minutes as against 25 to 30 minutes for ordinary dehydrated pieces.

The manifold developments in frozen potato products have generally been the result of industrial research and development. Offering first frozen French fries, the industry later branched out into mashed potatoes, slices, baked potatoes and small whole potatoes (boiled, roasted or fried) in frozen forms. Creamed potato dishes in many varieties and cream of potato soup were soon after made available in frozen form.

QUALITY IMPROVEMENT RESEARCH

Not all of the research on potato processing, by any means, is concerned with development of new products and processes. Substantial improvement in the quality and properties of an established food product may be for all practical purposes equivalent to development of an entirely new product. Quality improvement at a critical time can save a product from being superseded and/or result in greatly increased sales. Thus, basic research at the Eastern and Western Utilization Research and Development Divisions seeks to build up a reservoir of information relating to the composition and physical properties of the potato that will assist processors in controlling such problems as flavor, odor, color and texture deteriorations. Voluminous data have been collected on such factors as nature of the starch in potatoes and how the starch changes during cooking in various ways; the cellulose, hemicellulose and pectin that make up the cell wall in potato; potato sugars; the amino and other organic

acids; proteins and peptides; inorganic salts and inorganic acids; enzyme systems and reactions they catalyze; and minor constituents such as polyphenols.

NEW STUDIES

Current research at the Eastern Division seeks to discover differences, if they exist, in the amino acid contents of the principal varieties of potatoes grown in the leading producing areas. It further seeks to learn how these amino acids are involved in reactions occurring during various types of processing. One important line of research at the Western Division concerns the development of information, through gas chromatographic studies, regarding volatile flavor and odor compounds present in processed potatoes. Such an approach is of value in tagging constituents involved in an objectionable reaction, such as the formation of carbonyl and hydrocarbon compounds during oxidative deterioration of potato chips; it is also of value in spotting what constituents are responsible for the pleasant aroma of freshly cooked potatoes.

NONFOOD UTILIZATION OF POTATOES

Potatoes not shipped to the tablestock market or to processors are used for seed, livestock feed and starchmaking. Livestock feeding consumed each year, from 1956 to 1960, amounts ranging from about 8 million to 23 million hundredweights of potatoes. The starch industry's use of potatoes from the 1956-1960 crops is estimated as varying from 6 million to 15 million hundredweights per season. In this brief review of recent advances in potato processing, we have endeavored to show how the cooperative efforts of many groups have helped the potato industry immensely and brought about a long range prospect of optimism.

CHEMURGY AROUND THE WORLD

(Continued from page 2)

● **UGANDA:** An extensive program of investigation of the natural herbs in widespread use by African tribes as medicines has been initiated by the Uganda government. All claims will be thoroughly explored to establish the scientific values of these traditional materials for modern medicine. (40)

● **MICHIGAN:** U. of Michigan researchers have successfully used water saws with high pressure jets as small as one ten-thousandth of an inch in diameter to cut wood. It is felt this technique would have value in tree trimming and furniture since it allows greater speed, requires less equipment maintenance, and yields less sawdust. (41)

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The Chemurgic Council will be glad to send reference information on any items listed in this column. When writing please mention the issue of the Chemurgic Digest and the number of the item on which you would like additional information.